

PHYSICS 106 (Spring 2005)
EXAM 1 – VERSION A

NAME _____

RECITATION _____

INSTRUCTIONS:

- Please fill in your computer answer sheet filling in the circle on the sheet corresponding to the letters of numbers with a #2 pencil as follows:

In the NAME grid fill in your last name, leave one blank space, then your first name.

Write your ID number in the IDENTIFICATION NUMBER section of the sheet.

Write your recitation section number in the space K,L in the SPECIAL CODES section. The recitation section number should be preceded by a 0 (e.g. section 1 is written as 01).

Fill in the VERSION of this exam on #101 of the answer sheet.

In the next fifty minutes you need to answer all 20 questions for 5 points each. For each question, you should indicate in the answer sheet the best choice. Note that the multiple-choice questions on this exam are numbered 1 through 20. Check your answers carefully, making sure your answers are entered under the correct number, as no changes will be made after the exam is turned in. At the end of the exam you will have to hand in your notes, your exam paper and the answer sheet.

- You are allowed to use one page of handwritten notes. NO calculator is allowed.

1. In which of these relations will S double if T is doubled?

- A) $S=10T$ B) $T=1/S$ C) $T=S^2$ D) $S=1/T$ E) $S=T^2$
-

2. A 100 kg sack of potatoes falls from an airplane. As the velocity of the falling sack increases, so does the air resistance on it. When the air resistance equals 100 kg, the real acceleration a of the sack will be

- A. infinite. B. 9.8 m/s^2 . C. 9.8 m/s . D. 4.9 m/s^2 . E. zero
-

3. Your mass is 40 kg. Suppose you are standing on a scale in an elevator which starts moving up and increases its speed at the rate of 2 m/s every second. What would be the reading on the scale?

- A. 480 N B. 400 N C. 320 N D. 120 N E. 0
-

4. Which of the following is NOT an energy unit

- A. N m
B. Joule
C. Calorie
D. Watt
E. kWh
-

5. A child runs at 4.0 m/s and jumps onto a sled, initially at rest. If the child's mass is 30 kg, and if the child and sled slide off together at 3.0 m/s after the collision, the sled's mass is

- A. 5 kg. B. 10 kg. C. 20 kg. D. 30 kg. E. 40 kg.
-

6. A motor is lifting a mass of 35 kg at a constant speed of 6 m/s. The power developed by the motor to do the lifting is

- A. 740 W
- B. 1500 W
- C. 2100 W
- D. 59 W
- E. 43 W

7. The acceleration of gravity on the moon's surface is about $1/6$ of that on the Earth's surface. An object on the Earth is to be taken to the Moon. We can state that, compared to the Earth,

- A. the object's mass will be the same on the Moon.
- B. the object's mass will be greater on the Moon.
- C. the object's mass will be less on the Moon.
- D. the object's weight will be the same on the Moon.
- E. the object's weight will be greater on the Moon.

8. A 5.0-kg cat runs to the left at 10 m/s and a 10-kg dog runs to the right at 5.0 m/s. The total kinetic energy is

- A. -125 Joule.
- B. +125 Joule
- C. 0 Joule.
- D. 375 Joule.
- E. 500 Joule.

9. An auto moves 15 meters in the first second of travel, 15 more meters in the next second and 15 meters during the third second. The acceleration of the auto in m/s^2 is

- A. 1.50
 - B. 3.00
 - C. 9.8
 - D. 15
 - E. Zero
-

10. A car travels a distance of 60 km. For the first 30 minutes it is driven at a constant speed of 60 km/hr. The motor begins to vibrate and the driver reduces the speed to 30 km/hr for the rest of the trip. The average speed for the entire trip is:

- A. 60.0 km/hr.
- B. 53.3 km/hr.
- C. 50.0 km/hr.
- D. 47.5 km/hr.
- E. 40.0 km/hr.

11. Which of the following statements is TRUE?

- A. The kinetic (KE) and potential (PE) energies of an object must always be positive quantities.
- B. The KE and PE of an object must always be negative quantities.
- C. The KE can be negative, but PE cannot.
- D. The PE can be negative, but KE cannot.
- E. None of the preceding statements is true.

12. A 60 kg front seat passenger in a car moving initially with a speed of 20 m/s (45 MPH) is brought to rest by an air bag in a time of 0.5s. (What is the impulse acting on the passenger?, what is the average force acting on the passenger in this process?)

- | | | |
|---------------------|---------------------|---------------------|
| A (1200 Ns, 2400 N) | B (2400 Ns, 2400 N) | C (1200 Ns, 1200 N) |
| D (1200 Ns, 600 N) | E (2400 Ns, 1200N) | |
-

13. A man standing on a bridge throws a stone horizontally with a speed of 20 m/s. The stone hits the water below 2s later. The bridge height is

- A. 60 m. B. 40 m. C. 30 m. D. 20 m. E. 10 m

14. A ball is thrown upward with an initial velocity of 20 m/s. It will reach its maximum height in approximately

- A. 1 s. B. 1.5 s. C. 2 s. D. 2.5 s. E. 3 s.

15. A bullet is fired horizontally at a target 10 m away. The velocity of the bullet as it leaves the gun is 100 m/s. How much, approximately, will the bullet drop on its way to the target?

- A. 0.01 m. B. 0.02 m. C. 0.03 m. D. 0.04 m E. 0.05 m.

16. Suppose one's hand exerts a force of 12 N upward on a book weighing 10 N. The reaction to the force of the hand on the book is a force of

- A. 10 N exerted by the Earth on the book.
B. 10 N exerted by the book on the Earth.
C. 12 N exerted by the book on the hand.
D. 10 N exerted by the book on the hand.
E. 2 N exerted by the book on the hand.
-

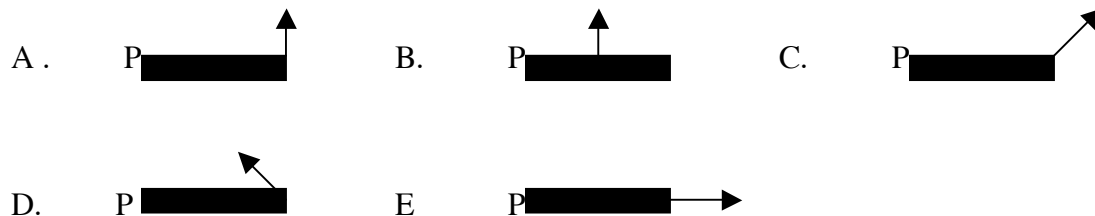
17. A force F produces an acceleration a on an object of mass m . A force $3F$ is exerted on a second object and an acceleration $8a$ results. What is the mass of the second object?

- A. $3m$ B. $9m$ C. $24m$ D. $(3/8)m$ E. $(8/3)m$

18. A person on a bicycle traveling at 10 m/s on a horizontal road stops pedaling as she starts up a hill inclined at 3.0 degrees to the horizontal. Ignoring friction forces, how far up the hill will travel before stopping? (It is given that $\sin(3)=0.05$ and $\cos(3)=0.998$).

- A. 5 m .
 B. 10 m .
 C. 50 m .
 D. 100 m .
 E. The answer depends on the mass of the person

19. In figure below, a given force is given F is applied to a rod in several different ways. In which case the torque due to F about the pivot P is greater?



20. A boy pulls a wooden box of mass m along a rough horizontal floor at constant speed by means of a force \mathbf{P} . The force diagram for the box is shown below. Which of the following must be true, where f and N are, respectively, the magnitudes of frictional and normal forces?

- A. $P > f$ and $N = mg$
- B. $P = f$ and $N = mg$
- C. $P > f$ and $N < mg$
- D. $P = f$ and $N > mg$
- E. $P < f$ and $N = mg$

